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Advances in Architectural Elements For Future Missions to Titan

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Abstract
The future exploration of Titan is of high priority for the solar system exploration community as recommended by the 2003 National Research Council (NRC) Decadal Survey [1] and ESA's Cosmic Vision Program themes. Recent Cassini-Huygens discoveries continue to emphasize that Titan is a complex world with very many Earth-like features. Titan has a dense, nitrogen atmosphere, an active climate and meteorological cycles where conditions are such that the working fluid, methane, plays the role that water does on Earth. Titan's surface, with lakes and seas, broad river valleys, sand dunes and mountains was formed by processes like those that have shaped the Earth. Supporting this panoply of Earth-like processes is an ice crust that floats atop what might be a liquid water ocean. Furthermore, Titan is rich in very many different organic compounds—more so than any place in the solar system, except Earth.

The Titan Saturn System Mission (TSSM) concept that followed the 2007 TandEM ESA CV proposal [2] and the 2007 Titan Explorer NASA Flagship study [3], was examined [4,5] and prioritized by NASA and ESA in February 2009 as a mission to follow the Europa Jupiter System Mission. The TSSM study, like others before it, again concluded that an orbiter, a montgolfi`re hot-air balloon and a surface package (e.g. lake lander, Geosaucer (instrumented heat shield), . . .) are very high priority elements for any future mission to Titan. Such missions could be conceived as Flagship/Cosmic Vision L-Class or as individual smaller missions that could possibly fit into NASA New Frontiers or ESA Cosmic Vision M-Class budgets. As a result of a multitude of Titan mission studies, a clear blueprint has been laid out for the work needed to reduce the risks inherent in such missions and the areas where advances would be beneficial for elements critical to future Titan missions have been identified.

The purpose of this paper is to provide a brief overview of the flagship mission architecture and to describe recent advances and ongoing planning for a Titan balloon and surface elements.

References

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